

II B.Tech I Semester Supplementary Examinations, November 2005
FLUID MECHANICS
(Civil Engineering)

Time: 3 hours**Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks

1. A painter is painting a wall 3mX4m with a brush 0.1m wide and 0.0125m thick the thickness of one coat of paint is 7×10^{-3} m and the viscosity of the paint is 2 Pa-s. Calculate the total work required for painting one side of the wall. Assume the variation of velocity as liner. [16]
2. A 1.8 m diameter cylindrical tank is laid with its axis horizontal on a level ground. Each of its ends are closed by a hemispherical dome. The tank contains oil of relative density 0.9 under pressure. If a pressure guage on the top of the tank reads 22 kPa, calculate the resultant force on the spherical end. [16]
3. (a) Define
 - i. path line
 - ii. stream line and
 - iii. streak line.
 - iv. stream tube(b) Show that $\Psi = x^2 - y^2$ represents a two dimensional irrotational flow. Find the potential function. [8+8]
4. (a) A jet of water from a 20 mm diameter nozzle is directed vertically upwards. Calculate the diameter of the jet at a point 6 m above the nozzle, if the velocity with which the jet leaves the nozzle is 15 m/s. Assume that the jet remains circular.
(b) A 300 mm diameter pipe carries water under a head of 20 m with a velocity of 3.5 m/s. If the axis of the pipe turns through 45° , find the magnitude and direction of the resultant force at the bend. [8+8]
5. (a) Differentiate between
 - i. Stream line body and bluff body
 - ii. Friction drag and pressure drag.(b) A kite 60cm x 60cm weighing 2.943 N assumes an angle of 10° to the horizontal. If the pull on the string is 29.43N when the wind is flowing at a speed of 40 km/hr. Find the corresponding coefficient of drag and lift. Density of air is given as 1.25 kg/m^3 . [8+8]
6. (a) Describe Reynold's experiment with a neat sketch. What are the outcomes of Reynolds experiment.

- (b) A crude oil of viscosity 0.97 poise and relative density 0.9 is flowing through a horizontal circular pipe of diameter 10cm and of length 10m. Calculate the difference of pressure at the two ends of the pipe, if 100 kg of the oil is collected in a tank in 30 seconds. [8+8]
7. The population of a city is 8×10^5 and it is to be supplied with water from a reservoir 6.4 km away. Water is to be supplied at the rate of 0.14 m^3 per head per day and half the supply is to be delivered in 8 hours. The full supply level of the reservoir is R.L 180.00. and its lowest water level is R.L.105.00. The delivery end of the main is at R.L 22.50 and the head required there is 12m. Find the diameter of the pipe. Take $f = 0.04$. [16]
8. A venturimeter having inlet diameter 100 mm and throat diameter 25 mm is fitted in a vertical pipe, throat is 0.3 m below the inlet, for measuring the flow of petrol of specific gravity 0.78. Pressure gauges are fitted at inlet and throat. Taking loss of head between inlet and throat as 36 times the velocity head at inlet, find c_d of the meter and the discharge when the inlet gauge reads 274.68 KN/m^2 . [16]
